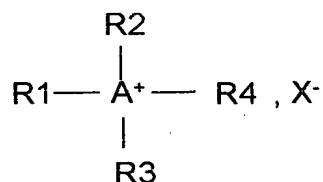


What is claimed is :

5 ~~1. A compound of the general formula (I) below :~~

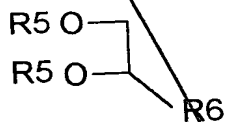
(I)



10  
Wherein A is a phosphorus or an arsenic atom; X<sup>-</sup> is an anion; and wherein R1 is selected from the group consisting of :

15 ~~a) the radical of formula (II) below :~~

(II)



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wherein R5 represents a lipid moiety and R6 is a linear or branched alkyl chain from 1 to 4 carbon atoms,

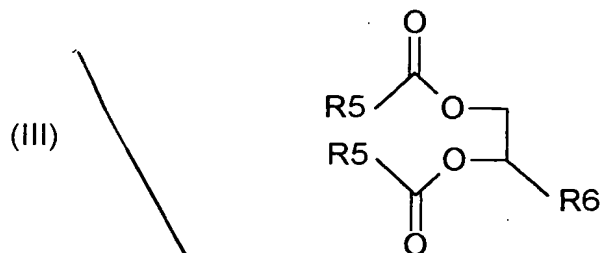
25 ~~Provided that R2, R3 and R4 of formula (I) represent each a methyl group;~~

b) the radical of formula (III) below :

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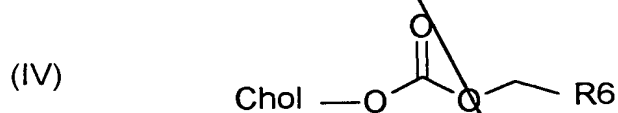
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SLIP  
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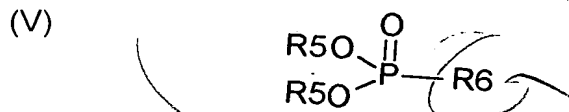
wherein R5 represents a lipid moiety and R6 is a linear or branched alkyl chain from 1 to 4 carbon atoms, provided that R2, R3 and R4 of formula (I) represent each a methyl group;

c) the radical of formula (IV) below :



wherein Chol means a cholesteryl radical and R6 is a linear or branched alkyl chain from 1 to 4 carbon atoms, provided that R2 and R3 of formula (I) represent each a methyl group; and

d) the radical of formula (V) below :



wherein R5 represents a lipid moiety and R6 is a linear or branched alkyl chain from 1 to 4 carbon atoms,

provided that R2 and R4 are alkyl chains from 1 to 4 carbon atoms; and

5 R3 is selected from the group consisting of:

- an alkyl chain as defined for R2 and R4,
- the functional group  $\text{CH}_2\text{-CH}_2\text{-P}^+(\text{R6R7R8})$ , wherein R6, R7 and R8 have the same meaning as R2 and R4; and
- $\text{CH}_2\text{-CO}_2\text{R9}$ , wherein R9 has the same meaning as R2.

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2. The compound of claim 1, wherein the anion X is selected from the group consisting of an halide,  $\text{CF}_3\text{SO}_3^-$ ,  $\text{CF}_3\text{CO}_2^-$  or  $\text{HSO}_4^-$ .

3. The compound of claim 2, wherein the halide is selected from the group consisting of  $\text{Cl}^-$ ,  $\text{Br}^-$  and  $\text{I}^-$ .

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4. The compound of claim 1, wherein the R5 lipid moiety is selected from the group consisting of :

- (i) an alkyl or an alkenyl chain containing from 10 to 22 carbon atoms comprising 0, 1 or 2 olefinic double bonds,
- (ii) a cholesteryl derivative
- (iii) a perfluoro alkyl chain from 10 to 22 carbon atoms.

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5. The compound of claim 1, wherein the R5 lipid moiety is selected from the group consisting of  $\text{C}_{14:0}$ ,  $\text{C}_{18:1}$ ,  $\text{C}_{18:2}$ ;  $\text{C}_{15:0}$ ,  $\text{C}_{17:0}$ ,  $\text{C}_{17:1}$ ,  $\text{C}_{17:2}$ , wherein the first number designates the number of carbon atoms and the second number designates the number of double bonds.

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6 The compound of claim 1, wherein R1 is of formula V and R2 and R4 represent each independently a radical selected from the group

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Sub 2  
B

Sub 3  
B


 consisting of  $\text{CH}_3$ ,  $\text{C}_2\text{H}_5$ ,  $n\text{C}_3\text{H}_7$ ,  $\text{iso-C}_3\text{H}_7$ , with  $n$  being an integer equal to 1, 2 or 3

7. The compound of claim 1 wherein R1 has the formula (II), (III) or (V),  
 5 the R5 lipid moiety consists of an alkyl chain and R6 is a methyl group.

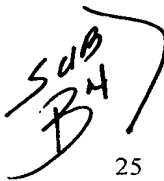
8. The compound of claim 1 wherein R1 has the formula (II), (III) or (V),  
 the R5 lipid moiety consists of an alkenyl chain and R6 is a methyl group.

10 9. The compound of claim 1 wherein R1 has the formula (II), (III) or (V),  
 the R5 lipid moiety consists of an alkyl chain and R6 is an ethyl group.

10. The compound of claim 1 wherein R1 has the formula (II), (III) or (V),  
 the R5 lipid moiety consists of an alkenyl chain and R6 is an ethyl group.

15 11. The compound of claim 1 wherein R1 has the formula (II), (III) or (V),  
 the R5 lipid moiety consists of an alkyl chain and R6 is a propyl group

12. The compound of claim 1 wherein R1 has the formula (II), (III) or (V),  
 20 the R5 lipid moiety consists of an alkenyl chain and R6 is a propyl group


 13. The compound of claim 1 wherein R1 has the formula (II), (III) or (V),  
 the R5 lipid moiety consists of a cholesteryl  $-\text{C}(\text{O})\text{N}-\text{CH}_2-\text{CH}_2-\text{O}-$  group  
 and R6 is an ethyl group.

25 14. The compound of claim 1 wherein R1 has the formula (II), (III) or (V),  
 the R5 lipid moiety consists of a perfluoroalkyl chain R6 is an ethyl  
 group.

15. The compound of claim 1 wherein R1 has the formula (II), (III) or (V), the R5 lipid moiety consists of an oleoyl chain ( $C_{17}H_{33}C(O)O$ ) and R6 is a propylen group.

5 16. A compound according to claim 1 wherein R1 has the formula (II), (III) or (V), the R5 lipid moiety consists of an oleyl chain ( $C_{18}H_{35}$ ) and R6 is a -1,2 deoxyglycerol group.

10 17. The compound of claim 1 wherein R1 has the formula (II), (III) or (V), the R5 lipid moiety consists of a cholesteryl group and R6 is a  $[C(O)O-CH_2-CH_2-]$  group.

15 18. A vesicle comprising the compound according to ~~any one of claims 1 to 17.~~ <sup>Claim 1</sup>

19. A vesicle consisting essentially of a compound according to any one of claims 1 to 17.

20 20. The vesicle of claim 18, which is a small unilamellar vesicle.

21. The vesicle of claim 18, which is a multilamellar vesicle.

22. A method for introducing *in vitro* a nucleic acid in a cell host comprising the steps of:

a) incubating said nucleic acid with a compound according to ~~any one of claims 1 to 17~~ <sup>Claim 1</sup> to obtain complexes formed between said nucleic acid and said compound; and

b) incubating the cell host with the complexes obtained at step a).

23. The method of claim 22, wherein the compound is under the form of unilamellar vesicles.

24. A method for introducing in vivo a nucleic acid in cells of an host organism comprising the steps of :

a) incubating said nucleic acid with a compound according to ~~any one of claims 1 to 17~~ to obtain complexes formed between said nucleic acid and said compound; and

b) administering the complexes obtained at step a) to said host organism.

25. The method of claim 24, wherein the organism is a mammal.

26. A complex formed between a nucleic acid and a compound according to any one of claims 1 to 17.

27. The complex of claim 26, wherein the nucleic acid comprises a polynucleotide encoding a polypeptide.

28. The complex of claim 26, wherein the nucleic acid comprises a polynucleotide which encodes an antisense polynucleotide.

29. The complex of claim 26, wherein the polynucleotide encoding a polypeptide is operably linked to a regulatory sequence.

30. A composition comprising a complex according to ~~any one of claims 26 to 29~~.

31. A pharmaceutical composition comprising a complex according to any one of claims 26 to 29.

claim 1

claim 26

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A

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